

What is claimed is:

1. A power supply for an implantable cardioverter-defibrillator for subcutaneous positioning between the third rib and the twelfth rib and using a lead system that does not directly contact a patient's heart or reside in the intrathorasic blood vessels and for providing anti-tachycardia pacing energy to the heart, the power supply comprising:

a capacitor subsystem for storing the anti-tachycardia pacing energy for delivery to the patient's heart; and

a battery subsystem electrically coupled to the capacitor subsystem for providing the anti-tachycardia pacing energy to the capacitor subsystem.

2. The power supply of claim 1, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 5 volts to approximately 500 volts.

3. The power supply of claim 2, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 5 volts to approximately 25 volts.

032580.0028.UTL

4. The power supply of claim 2, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 25 volts to approximately 50 volts.

5

5. The power supply of claim 2, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 50 volts to approximately 75 volts.

6. The power supply of claim 2, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 75 volts to approximately 100 volts.

7. The power supply of claim 2, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 100 volts to approximately 150 volts.

8. The power supply of claim 2, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 150 volts to approximately 200 volts.

00940266-082701

20

5

4

20

having a peak voltage that is approximately 400 volts to approximately 450 volts.

5 14. The power supply of claim 2, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 450 volts to approximately 500 volts.

15. The power supply of claim 1, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a pulse width that is approximately 2 milliseconds to approximately 40 milliseconds.

16. The power supply of claim 15, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a pulse width that is approximately 2 milliseconds to approximately 10 milliseconds.

20 17. The power supply of claim 15, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a pulse width that is approximately 10 milliseconds to approximately 20 milliseconds.

00940255 089701
T02580 99204668

18. The power supply of claim 15, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a pulse width that is approximately 20 milliseconds to approximately 30 milliseconds.

5

19. The power supply of claim 15, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a pulse width that is approximately 30 milliseconds to approximately 40 milliseconds.

20. The power supply of claim 1, wherein the anti-tachycardia pacing energy comprises a biphasic waveform further comprising a positive voltage portion and a negative voltage portion.

21. The power supply of claim 20, wherein the positive voltage portion further comprises a tilt of approximately 10% to approximately 90%.

22. The power supply of claim 21, wherein the tilt is approximately 50%.

10
00940256.000701
T02880.99204660

20

23. The power supply of claim 20, wherein the negative voltage portion further comprises a tilt of approximately 10% to approximately 90%.

5 24. The power supply of claim 23, wherein the tilt is approximately 50%.

25. The power supply of claim 1, wherein the anti-tachycardia pacing energy comprises a biphasic waveform that is provided at a rate of approximately 100 to approximately 300 stimuli/minute.

26. The power supply of claim 25, wherein the biphasic waveform is provided after a patient's heart rate is greater than or equal to approximately 100 beats/minute.

27. The power supply of claim 26, wherein the biphasic waveform is provided after a patient's heart rate is associated with a monomorphic ECG pattern.

28. The power supply of claim 1, wherein the lead system comprises an electrode located proximate the sternum and anterior portion of the patient's heart.

29. The power supply of claim 1, wherein the anti-tachycardia pacing energy comprises burst pacing energy.

30. The power supply of claim 1, wherein the anti-tachycardia pacing energy comprises ramp pacing energy.

31. A voltage output system for an implantable cardioverter-defibrillator for subcutaneous positioning between the third rib and the twelfth rib and using a lead system that does not directly contact a patient's heart or reside in the intrathoracic blood vessels and for providing anti-tachycardia pacing energy to the heart, the power supply comprising:

an energy storage system for storing the anti-tachycardia pacing energy for delivery to the patient's heart; and

an energy source system electrically coupled to the capacitor subsystem for providing the anti-tachycardia pacing energy to the capacitor subsystem.

32. The voltage output system of claim 31, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 5 volts to approximately 500 volts.

33. The voltage output system of claim 32, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 5 volts to approximately 25 volts.

34. The voltage output system of claim 32, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 25 volts to approximately 50 volts.

35. The voltage output system of claim 32, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 50 volts to approximately 75 volts.

36. The voltage output system of claim 32, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 75 volts to approximately 100 volts.

37. The voltage output system of claim 32, wherein the anti-tachycardia pacing energy comprises a biphasic

10/280-992070650

waveform having a peak voltage that is approximately 100 volts to approximately 150 volts.

5 38. The voltage output system of claim 32, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 150 volts to approximately 200 volts.

39. The voltage output system of claim 32, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 200 volts to approximately 250 volts.

40. The voltage output system of claim 32, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 250 volts to approximately 300 volts.

20 41. The voltage output system of claim 32, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 300 volts to approximately 350 volts.

0040266-032701

42. The voltage output system of claim 32, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 350 volts to approximately 400 volts.

5

43. The voltage output system of claim 32, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 400 volts to approximately 450 volts.

44. The voltage output system of claim 32, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 450 volts to approximately 500 volts.

45. The voltage output system of claim 31, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a pulse width that is approximately 2 milliseconds to approximately 40 milliseconds.

20

46. The voltage output system of claim 45, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a pulse width that is approximately 2 milliseconds to approximately 10 milliseconds.

10/25/00 99204666

47. The voltage output system of claim 45, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a pulse width that is approximately 10 milliseconds to approximately 20 milliseconds.

48. The voltage output system of claim 45, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a pulse width that is approximately 20 milliseconds to approximately 30 milliseconds.

49. The voltage output system of claim 45, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a pulse width that is approximately 30 milliseconds to approximately 40 milliseconds.

50. The voltage output system of claim 31, wherein the anti-tachycardia pacing energy comprises a biphasic waveform further comprising a positive voltage portion and a negative voltage portion.

51. The voltage output system of claim 50, wherein the positive voltage portion further comprises a tilt of approximately 10% to approximately 90%.

00940266-062701

52. The voltage output system of claim 51, wherein the tilt is approximately 50%.

5 53. The voltage output system of claim 50, wherein the negative voltage portion further comprises a tilt of approximately 10% to approximately 90%.

54. The voltage output system of claim 53, wherein the tilt is approximately 50%.

55. The voltage output system of claim 31, wherein the anti-tachycardia pacing energy comprises a biphasic waveform that is provided at a rate of approximately 100 to approximately 300 stimuli/minute.

56. The voltage output system of claim 55, wherein the biphasic waveform is provided after a patient's heart rate is greater than or equal to approximately 100 beats/minute.

57. The voltage output system of claim 56, wherein the biphasic waveform is provided after a patient's heart rate is associated with a monomorphic ECG pattern.

58. The voltage output system of claim 31, wherein the lead system comprises an electrode located proximate the sternum and anterior portion of the patient's heart.

5

59. The voltage output system of claim 31, wherein the anti-tachycardia pacing energy comprises burst pacing energy.

60. The voltage output system of claim 31, wherein the anti-tachycardia pacing energy comprises ramp pacing energy.

61. An implantable cardioverter-defibrillator for subcutaneous positioning between the third rib and the twelfth rib within a patient, the implantable cardioverter-defibrillator comprising:

a housing having an electrically conductive surface on an outer surface of the housing;

a lead assembly electrically coupled to the housing and having an electrode, wherein the lead assembly does not directly contact the patient's heart or reside in the intrathorasic blood vessels;

TO 4230 9920465B

20

5 a capacitor subsystem located within the housing and electrically coupled to the electrically conductive surface and the electrode for storing anti-tachycardia pacing energy and for delivering the anti-tachycardia pacing energy to the patient's heart through the electrically conductive surface and the electrode; and

a battery subsystem electrically coupled to the capacitor subsystem for providing the anti-tachycardia pacing energy to the capacitor subsystem.

62. The implantable cardioverter-defibrillator of claim 61, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 5 volts to approximately 500 volts.

63. The implantable cardioverter-defibrillator of claim 62, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 5 volts to approximately 25 volts.

64. The implantable cardioverter-defibrillator of claim 62, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 25 volts to approximately 50 volts.

65. The implantable cardioverter-defibrillator of claim 62, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 50 volts to approximately 75 volts.

66. The implantable cardioverter-defibrillator of claim 62, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 75 volts to approximately 100 volts.

67. The implantable cardioverter-defibrillator of claim 62, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 100 volts to approximately 150 volts.

68. The implantable cardioverter-defibrillator of claim 62, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 150 volts to approximately 200 volts.

69. The implantable cardioverter-defibrillator of claim 62, wherein the anti-tachycardia pacing energy

032580.0028.UTL

comprises a biphasic waveform having a peak voltage that is approximately 200 volts to approximately 250 volts.

5 70. The implantable cardioverter-defibrillator of claim 62, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 250 volts to approximately 300 volts.

10 71. The implantable cardioverter-defibrillator of claim 62, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 300 volts to approximately 350 volts.

15 72. The implantable cardioverter-defibrillator of claim 62, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 350 volts to approximately 400 volts.

20 73. The implantable cardioverter-defibrillator of claim 62, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 400 volts to approximately 450 volts.

0040266 082701
T02280 9920466

74. The implantable cardioverter-defibrillator of claim 62, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 450 volts to approximately 500 volts.

5

75. The implantable cardioverter-defibrillator of claim 61, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a pulse width that is approximately 2 milliseconds to approximately 40 milliseconds.

76. The implantable cardioverter-defibrillator of claim 75, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a pulse width that is approximately 2 milliseconds to approximately 10 milliseconds.

77. The implantable cardioverter-defibrillator of claim 76, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a pulse width that is approximately 10 milliseconds to approximately 20 milliseconds.

10040266-082701
10/28/99

20

78. The implantable cardioverter-defibrillator of claim 76, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a pulse width that is approximately 20 milliseconds to approximately 30 milliseconds.

79. The implantable cardioverter-defibrillator of claim 76, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a pulse width that is approximately 30 milliseconds to approximately 40 milliseconds.

80. The implantable cardioverter-defibrillator of claim 61, wherein the anti-tachycardia pacing energy comprises a biphasic waveform further comprising a positive voltage portion and a negative voltage portion.

81. The implantable cardioverter-defibrillator of claim 80, wherein the positive voltage portion further comprises a tilt that is approximately 10% to approximately 90%.

82. The implantable cardioverter-defibrillator of claim 81, wherein the tilt is approximately 50%.

83. The implantable cardioverter-defibrillator of claim 80, wherein the negative voltage portion further comprises a tilt of approximately 10% to approximately 90%.

5

84. The implantable cardioverter-defibrillator of claim 83, wherein the tilt is approximately 50%.

85. The implantable cardioverter-defibrillator of claim 61, wherein the anti-tachycardia pacing energy comprises a biphasic waveform that is provided at a rate of approximately 100 to approximately 300 stimuli/minute.

86. The implantable cardioverter-defibrillator of claim 85, wherein the biphasic waveform is provided after a patient's heart rate is greater than or equal to approximately 100 beats/minute.

87. The implantable cardioverter-defibrillator of claim 86, wherein the biphasic waveform is provided after a patient's heart rate is associated with a monomorphic ECG pattern.

9940265.032701

20

5

90. The implantable cardioverter-defibrillator of claim 60, wherein the anti-tachycardia pacing energy comprises ramp pacing energy.

20

67

92. The method of claim 91, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 5 volts to approximately 500 volts.

93. The method of claim 92, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 5 volts to approximately 25 volts.

94. The method of claim 92, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 25 volts to approximately 50 volts.

95. The method of claim 92, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 50 volts to approximately 75 volts.

96. The method of claim 92, wherein the anti-tachycardia pacing energy comprises a biphasic waveform

004026-032701

5

5

5

5

20

101. The method of claim 92, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 300 volts to approximately 350 volts.

5

102. The method of claim 92, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 350 volts to approximately 400 volts.

103. The method of claim 92, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 400 volts to approximately 450 volts.

104. The method of claim 92, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a peak voltage that is approximately 450 volts to approximately 500 volts.

20

105. The method of claim 91, wherein the anti-tachycardia pacing energy comprises a biphasic waveform having a pulse width that is approximately 2 milliseconds to approximately 40 milliseconds.

70

5

20

tachycardia pacing energy comprises a biphasic waveform

further comprising a positive voltage portion and a negative voltage portion.

111. The method of claim 110, wherein the positive voltage portion further comprises a tilt of approximately 10% to approximately 90%.

112. The method of claim 111, wherein the tilt is approximately 50%.

113. The method of claim 110, wherein the negative voltage portion further comprises a tilt of approximately 10% to approximately 90%.

114. The method of claim 113, wherein the tilt is approximately 50%.

115. The method of claim 91, wherein the anti-tachycardia pacing energy comprises a biphasic waveform that is provided at a rate of approximately 100 to approximately 300 stimuli/minute.

102230" 99207658

116. The method of claim 115, wherein the biphasic waveform is provided after a patient's heart rate is greater than or equal to approximately 100 beats/minute.

5

117. The method of claim 116, wherein the biphasic waveform is provided after a patient's heart rate is associated with a monomorphic ECG pattern.

118. The method of claim 91, wherein the lead system comprises an electrode located proximate the sternum and anterior portion of the patient's heart.

119. The method of claim 91, wherein the anti-tachycardia pacing energy comprises burst pacing energy.

120. The method of claim 91, wherein the anti-tachycardia pacing energy comprises ramp pacing energy.

*add
A1*

032580.0028.UTL